

FIG.1

This Invention

Probe Card  
Fig.13A

A plurality of  
tips  
 $10 \leq r \leq 20 \mu\text{m}$

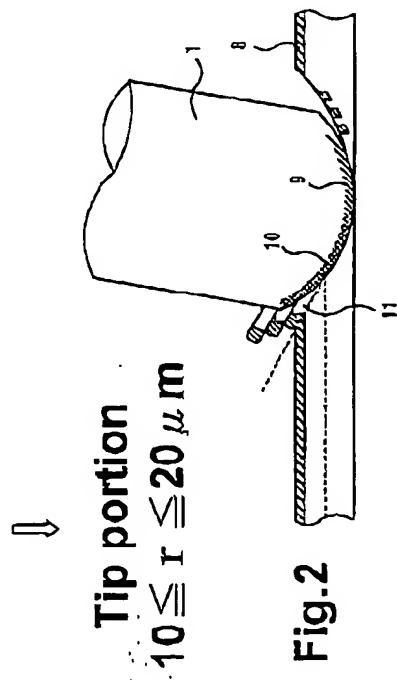
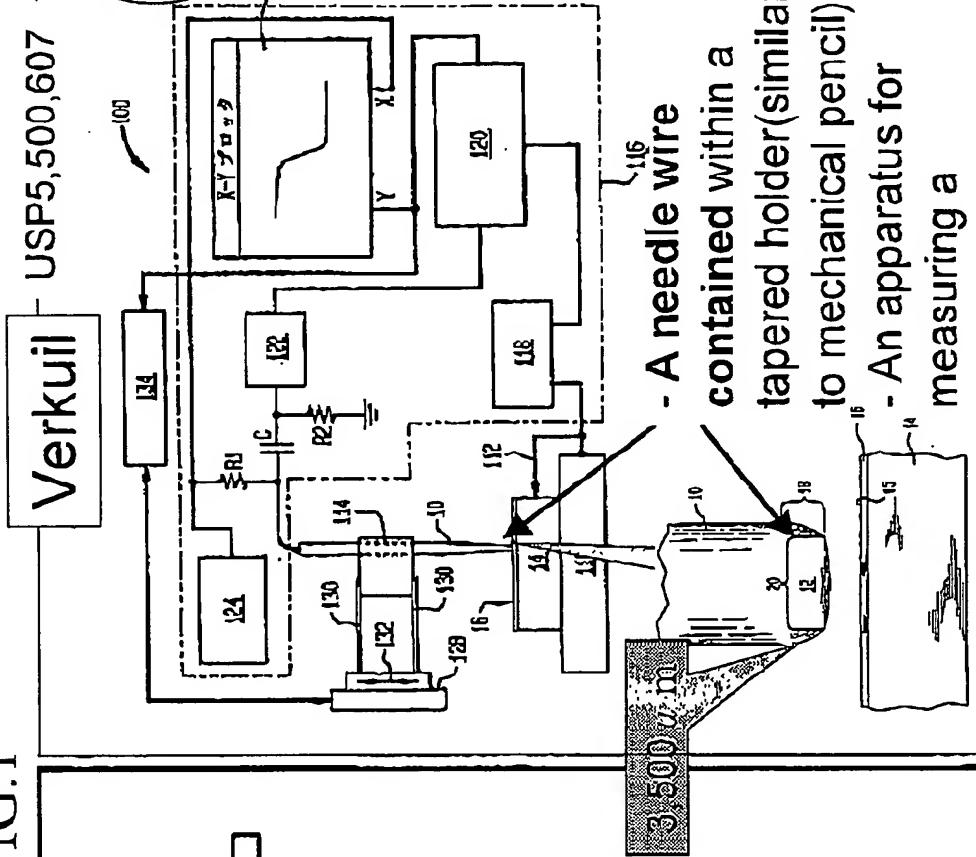


Fig.2

- Tip portions are urged against a plurality of metal pads.
- A probe card for testing an electrical characteristic of a semiconductor device
- A tip breaks an oxide film on a metal pad and the tip contacts with a conductive layer.

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USP5,500,607

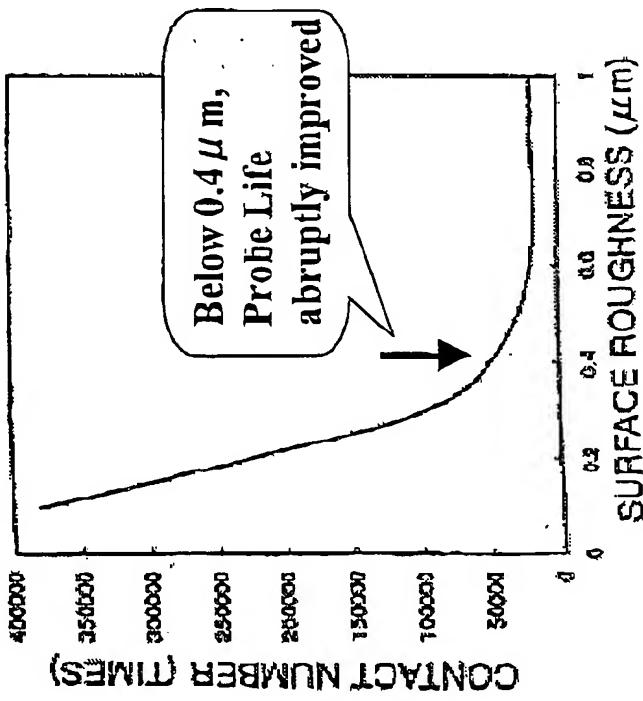
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SEP 8 2005  
1443



- A needle wire contained within a tapered holder (similar to mechanical pencil).
- An apparatus for measuring a breakdown of an insulator (Oxide film) on semiconductor.
- Not disclose about breaking an oxide film for contacting with a conductive layer.

FIG.2

This invention



- Teach an effective roughness and radius.

$$10 \mu\text{m} \leq r \leq 20 \mu\text{m}$$

$$\text{roughness} \leq 0.4 \mu\text{m}$$

- A spherical tip can occur shear deformation successfully, and break and drive out oxide thin film on metal pad. Therefore tip can contact with a conductive layer.

Kusumoto

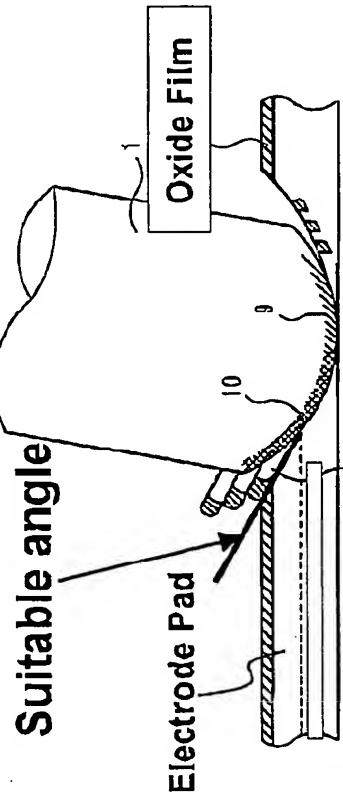
JP08-166407

電解液 類	濃度 (g/l)	電解条件			表面粗さ	
		先端部 曲率 (R)	最終電圧 (V)	時間 (分)	最大粗さ (μm)	Ry (μm)
OH H	10 20	3 R 0.6 R	—	—	0.90 0.80	0.93 0.90
OH H	10 15	2.5 R 4 R	0.2 0.1	5 3	0.65 0.85	0.61 0.92
OH H	30	1 R	0.2	5	<u>0.60</u>	0.69
—	—	—	—	—	3.30	—
—	—	—	—	—	3.65	—
—	—	平面	—	—	6.55 2.30	6.90 2.53

- Disclose a probe having a surface roughness of **0.6 μm**
- Not disclose a probe having a surface roughness equal to or less than **0.4 μm**.
- Never teach an effective roughness and radius of a tip.

FIG.3

**This invention**

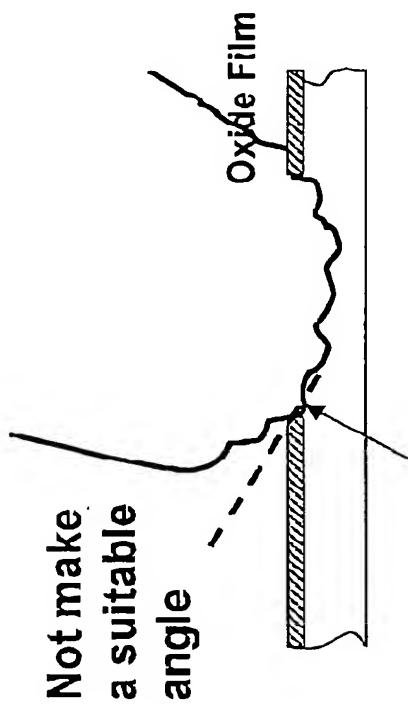


- Suitable radius [ $r$ ] and roughness of tip

$$10 \mu m \leq r \leq 20 \mu m$$
$$\text{roughness} \leq 0.4 \mu m$$

make a shear deformation successfully, break and drive out oxide thin film on metal pad.

**Conventional**



This portion prevents to make a lamination stack

- Conventional tip

Not make a shear deformation,  
Not break and drive out oxide thin film on metal pad.